REMARKS

Applicant acknowledges with appreciation that Claims 1-6 are allowable if amended to overcome a rejection under 35 U.S.C. 112 second paragraph. Independent Claim 1 is amended to include the limitation that the reflected target beam is returned by the separated reflectors to the polarizing beam splitter for combination with the local beam, and both the reflected target beam and the local beam are passed to the signal photodetector (Specification page 4 line 22 to page 5 line 10). Claims 2-6 depend from and further limit independent Claim 1. Claims 1-6 are believed allowable based on the above described amendment.

Claims 7 and 10 are amended to correct typographical errors. Claim 13 is cancelled without prejudice or disclaimer. Claims 15-18 are newly added. Claims 1-12, and 14-18 remain in the case.

The Office Action also rejected Claims 11-14 under 35 U.S.C. 112 second paragraph. Applicant respectfully submits amendments to Claims 11, and 14 to address this issue as herein described.

Independent Claim 11 is amended to include the mixing of the first portion and the second portion in a reference location where the interference intensity modulation including a parasitic interference is generated (Specification page 7 ll. 7-13). Claim 11 is focused on the aspect of how the target beam travels to the target, generating intensity modulation that is detected to isolate the portion of the modulated carrier signal that has traveled to the target.

Independent Claim 14 is amended to include the second portion of the modulated carrier signal that does not travel to the target location, is instead passed as an interference signal directly to the photodetector in a reference location (Specification Fig. 1, page 5 ll. 7-10, and page 9 ll. 11-13). The Office Action is correct in stating that the interference signal is supposed to be used as a reference, arriving at the photodetector along with the true signal, as shown in Fig. 1 and described above. Applicant respectfully requests that this rejection be withdrawn.

Claims 7, 11, and 14 are amended to include the term "optical" before reference location where the target beam and the local beam recombine in keeping with Fig. 1 and as described in the amended paragraphs page 4 line 22 to page 5 line 10 and page 7 ll. 6-20, as amended.

Claims 11 and 14 are amended to include the term "self-interference" for the parasitic interference in keeping with the Specification page 7 ll. 11-13 and elsewhere.

New Claims 15-18 are believed allowable since independent Claim 15 is believed to provide the allowable subject matter of Claims 1 and 6 while reciting the additional limitations of the quarter-wave plates (200, 220). Claim 16 depends from and further limits Claim 15 by adding the limitation the phase-modulation frequency Ω is 7.5 MHz as described in the Specification page 9 ll. 4-6. Claims 17-18 depend from and further limit Claim 15 by adding the limitation that the reference phase and the signal phase are detected by a heterodyne frequency beat as described in the Specification page 4 ll. 17-19 and page 5 ll. 9-10. The heterodyne frequency beat also called an interference beat.

The Office Action rejected Claims 7-14 under 35 U.S.C. 102(b) as being anticipated by *Otsuka* (U.S. Patent No. 5,493,395). Applicant respectfully traverses this rejection in its entirety.

The present invention is drawn to a distance measuring device implemented with a non-standard heterodyne interferometer system including carrier phase modulation and frequency shifting that increases the accuracy in length measurement by minimizing self-interference (Specification page 2 ll. 16-18). The magnitude and frequency of the carrier phase modulation are chosen appropriately for the measured distance L (Specification page 5 ll. 11-13). The measured distance L spans a distance between two reflectors, a target reflector and a reference reflector (Specification Fig. 1 and page 5 ll. 11-23). A target beam traveling to and between the reflectors experiences a differential delay and generates an intensity modulation that is used to discriminate and isolate a target signal from a parasitic self-interference beat resulting from leakage and scatter (Specification page 7 ll. 9-13).

In contrast, Otsuka is drawn to a wavelength measuring apparatus that uses a standard heterodyne interferometer. Otsuka does not disclose a phase modulator element as used in the present invention in combination with frequency shifters. Otsuka discloses elements 14a and 14b which are termed "AO (acousto-optical) modulators", but these items are not phase modulators and are instead clearly described as frequency shifters (Otsuka col. 3 ll. 8-14). The phase modulator of the present invention applies a phase modulation to the carrier frequency before applying the modulated carrier to one or more frequency shifters to generate the heterodyne signal (Specification page page 2 ll. 18-20 and page 4 ll. 9-12). In Otsuka, the light in the target path is passed through a predetermined optical path via two prism reflecting mirrors as an optical path length difference imparting means in order to provide greater detection of the wavelength variation (Otsuka col. 3 ll. 14-19). The larger the length difference, the greater the ability to measure wavelength variations with a relatively unstable laser light source. On the

other hand, if the laser light source was stable, the apparatus of Otsuka could then be used to measure an optical path length difference. Otsuka discloses measuring an amount of movement of a separate reference mirror, which is different from the two prism reflecting mirrors used to measure the wavelength variation (Otsuka col. 4 ll. 29-31). The measurement of a change in distance, caused by movement relative to some initial position, is a common application of a standard interferometer without carrier phase modulation. Fundamentally, Otsuka does not disclose the improvement of isolating the target signal and excluding the self-interference signal as claimed in the present invention.

As shown in the section titled SPECIFICATION AMENDMENTS, the specification at page 4 ll. 9-16 has been amended to support the existing terminology used in Claim 1 regarding the nature of the phase modulation being a sinusoidal carrier phase modulation. Further, the specification has been amended at page 4 ll. 9-16 to identify the beam splitter element 280 in Fig. 1 as amended. The specification has been amended at page 4 line 22 to page 5 line 10 to associate the region where the target beam and the reference beam are recombined as the optical reference location 290 as added to Fig. 1. Finally, the specification is amended at page 7 ll. 6-20 to support Claims 1, 11, and 14 regarding the existing terminology "sinusoidal", "target signal", "true signal", and "reference location". These amendments are supported by the Claims, Fig. 1, the specification in the cited paragraph itself, at page 3 ll. 1-4, page 4 line 22 to page 5 line 10, and page 9 ll. 11-13. No new matter is added.

Regarding Fig. 1 as amended, the function of element 170 as a polarizing beam splitter is clearly described as transmitting light of a first orientation to serve as an optical phase reference (Specification page 4 ll. 22-24), reflecting light of a second orientation to a pair of reflectors

(Specification page 5 ll. 1-2 and 4-6), and combining the reflected and the transmitted light so that interference beats between the reflected and the transmitted light may be detected by the signal photodetector (Specification page 5 ll. 9-10). The transmitting of light of a first orientation and reflecting of light of a second orientation clearly identifies element 170 as a polarizing beam splitter. Element 130 is also described as a polarizing beam splitter (Specification page 4 ll. 12-16). Hence, Fig. 1 has been amended to graphically identify element 170 as a polarizing beam splitting element similar to the graphical description of element 130.

CONCLUSION

It is believed that all claims are in condition for allowance, and an early notification of the same is requested.

If there are any questions with regard to prosecution of this case, the undersigned attorney can be contacted at the listed telephone number.

I hereby certify that this correspondence is being deposited with the U.S. Postal Service as first class mail in an envelope addressed to: Assistant Commissioner for Patents, Washington, DC 20231.
on Sept. 12, 2003.

by:

John H. Kusmiss
Printed Name

John H. Kusmiss
Signature

Date of Signature: 9/12/03

Sincerely yours,

John H. Kusmiss

John H. Kusmiss
Attorney of Record
Registration No. 32,149
Telephone: (818) 354-7770